Check List the journal of biodiversity data

NOTES ON GEOGRAPHIC DISTRIBUTION

Check List 13 (6): 909–912
https://doi.org/10.15560/13.6.909

PENSOFT.

Updates on the distribution of the Cantor's Leaf-nosed Bat, *Hipposideros galeritus* Cantor, 1846 (Chiroptera, Hipposideridae): new records from peninsular India

Harpreet Kaur,[1] C. Srinivasulu,[1,2] T.A. Shah,[1] G. Devender,[1] B. Srinivasulu[1,2,3]

1 Natural History Museum and Wildlife Biology and Taxonomy Lab, Department of Zoology, University College of Science, Osmania University, Hyderabad - 500 007, India. **2** Systematics, Ecology and Conservation Laboratory, Zoo Outreach Organization, 96, Kumudham Nagar, Vilankurichi Road, Coimbatore - 641 035, Tamil Nadu, India. **3** Biodiversity Research and Conservation Society, 303 Nestcon Orchid, Sri Sainagar Colony, Kanajiguda, Tirumalgiri, Secunderabad - 500 015, India.
Corresponding author: Harpreet Kaur, hkaur.ou@gmail.com

Abstract
Hipposideros galeritus Cantor, 1846 has been hitherto reported from 18 localities in peninsular India. In this paper we report 3 new locality records of the species from Karnataka and 1 new record from Andhra Pradesh, based on photographic evidence and morphometrics (external morphological and cranio-dental). These records extend the southeastern limit of the known geographic location of the species by about 430 km in Karnataka State.

Key words
Range extension; peninsular India; new records.

Academic editor: Faisal Anwarali Khan | Received 20 November 2016 | Accepted 15 June 2017 | Published 1 December 2017

Citation: Kaur H, Srinivasulu C, Shah TA, Devender G, Srinivasulu B (2017) Updates on the distribution of the Cantor's Leaf-nosed Bat, *Hipposideros galeritus* Cantor, 1846 (Chiroptera, Hipposideridae): new records from peninsular India . Check List 13 (6): 909–912. https://doi.org/10.15560/13.6.909

Introduction

Leaf-nosed bats (Family Hipposideridae) are distributed from Africa through Asia to Australia (Simmons 2005). In the Indian subcontinent, the genus *Hipposideros* Gray, 1831 is currently represented by 13 species, of which 3 species (*H. durgadasi*, *H. hypophyllus*, and *H. nicobarulae*) are endemic to India (Srinivasulu and Srinivasulu 2012). Species belonging to the genus *Hipposideros* are small to medium-sized (forearm length between 33.0 mm and 99.0 mm) insectivorous bats that roost in caves, old temples, dilapidated old buildings, and tunnels. They are characterized by the presence of a short muzzle and a simple or a complex noseleaf around the nostrils, which is comprised of an anterior leaf (with or without emargination), an intermediate leaf, and a posterior leaf subdivided by septa into cells. The noseleaf is often flanked by supplementary leaflets, ranging in number from 0 to 4, and the last supplementary leaflet is much reduced in some species. Narial lappets on the outer margins of nostrils may or may not be present; pointed ears are with large antitragus and no tragus; and a well-developed tail, except the extreme tip, is enclosed in the interfemoral membrane (Hill et al. 1986).

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Methods

After procuring survey and collection permits from Karnataka Forest Department, surveys were conducted to document the current status of bats in certain districts of Karnataka, India. We recorded the presence of 2 males and 1 female *Hipposideros* sp., one each from Avani, Kolar district (13.60° N, 078.19° E) on 9 November 2013; Shivagange, Tumkur district (13.10° N, 077.13° E) on 13 November 2013; and Ukkarahalli, Kolar district (12.55° N, 078.14° E) on 14 May 2014 (WGS84 Datum was used while preparing the location map). On a subsequent survey in East Godavari district, Andhra Pradesh, India, we recorded the presence of 5 individuals of *Hipposideros* sp. in a small cave in Donkarai (17.57° N, 081.44° E), of which 1 male was captured. As reported earlier by Brosset (1962), all the observed individuals were roosting in isolated, small, dark cave-like rooms in old temples, or caves. The echolocation calls of the roosting individuals were recorded using ANABAT SD1 bat detector (Titley Electronics, Ballina, New South Wales, Australia) (see Grinnell and Hagiwara 1972, Srinivasulu et al. 2015). The individuals (1 male each from Shivagange, Karnataka and Donkarai, Andhra Pradesh; and one female from Ukkarahalli, Karnataka) were captured using mist nets, photographed and then retained as voucher specimens after taking standard morphometric measurements to the nearest 0.1 mm (Table 1). No voucher specimens were collected from Avani, Karnataka. The measurements included forearm length (FA), head and body length (HB), tail length (T), ear length (E), hind foot length (HF), horseshoe width, length of the penis, greatest length of the skull (GTL), condylo-canine length (CCL), zygomatic breadth (ZB), braincase breadth (BB), maxillary toothrow (C–M^3), posterior palatal breadth (M^3–M^3), anterior palatal breadth (C^1–C^1), mandible length (M), and mandibular toothrow (C–M_3). Measurements were taken using a digital vernier calliper (Mitutoyo Co.). The voucher specimens (Voucher numbers provided in Table 1) were deposited in the collection of the Natural History Museum of Osmania University, Hyderabad, Telangana State.

Figure 1. Adult female, *Hipposideros galeritus*, Cantor's Leaf-nosed Bat, *Hipposideros galeritus* from Ukkarahalli, Kolar district, Karnataka, India.

Table 1. External measurements (in mm) of *Hipposideros galeritus* from Karnataka and Andhra Pradesh, India. Abbreviations: FA = forearm length, HB = head and body length, T = tail length, E = ear length, HF = length of hind foot, GTL = greatest length of the skull, CCL = condylo-canine length, ZB = zygomatic breadth, BB = braincase breadth, C–M^3 = maxillary toothrow, C^1–C^1 = anterior palatal breadth, M^3–M^3 = posterior palatal breadth, M = mandible length, and C–M_3 = mandibular toothrow.

Location	Avani, Kolar district, Karnataka (no vouchers collected)	Ukkarahalli, Kolar district, Karnataka (CHI.31.2014)	Shivagange, Tumkur district, Karnataka (CHI.35.2014)	Donkarai, East Godavari district, Andhra Pradesh (CHI.7.2014)	Bates and Harrison 1997; Srinivasulu et. al. 2010 (Min.–Max.)
Sex	♂	♀	♂	♂	—
FA	47.79	47.83	47.95	47.06	45.0–51.3
HB	42.81	47.30	46.57	41.89	45–59.5
T	41.05	33.60	37.91	33.58	29.5–37.0
E	13.54	11.73	12.82	13.03	14.5–17.0
HF	6.41	4.73	6.26	7.22	4.9–8.0
GTL	—	17.63	17.69	17.05	16.8–18.9
CCL	—	14.76	15.08	15.04	14.6–15.8
ZB	—	8.76	9.1	8.62	8.4–9.3
BB	—	7.8	7.99	8.42	7.2–8.2
C–M^3	—	5.66	5.78	5.88	5.3–6.2
C^1–C^1	—	3.21	3.53	3.26	3.5–4.2
M^3–M^3	—	5.98	5.87	6.14	5.7–6.3
M	—	10.42	10.37	10.47	10.0–11.4
C–M_3	—	6.24	6.28	6.35	5.9–6.3
Horseshoe width	8.26	5.48	6.44	5.39	—
Length of the penis	7.27	-	5.25	4.84	—

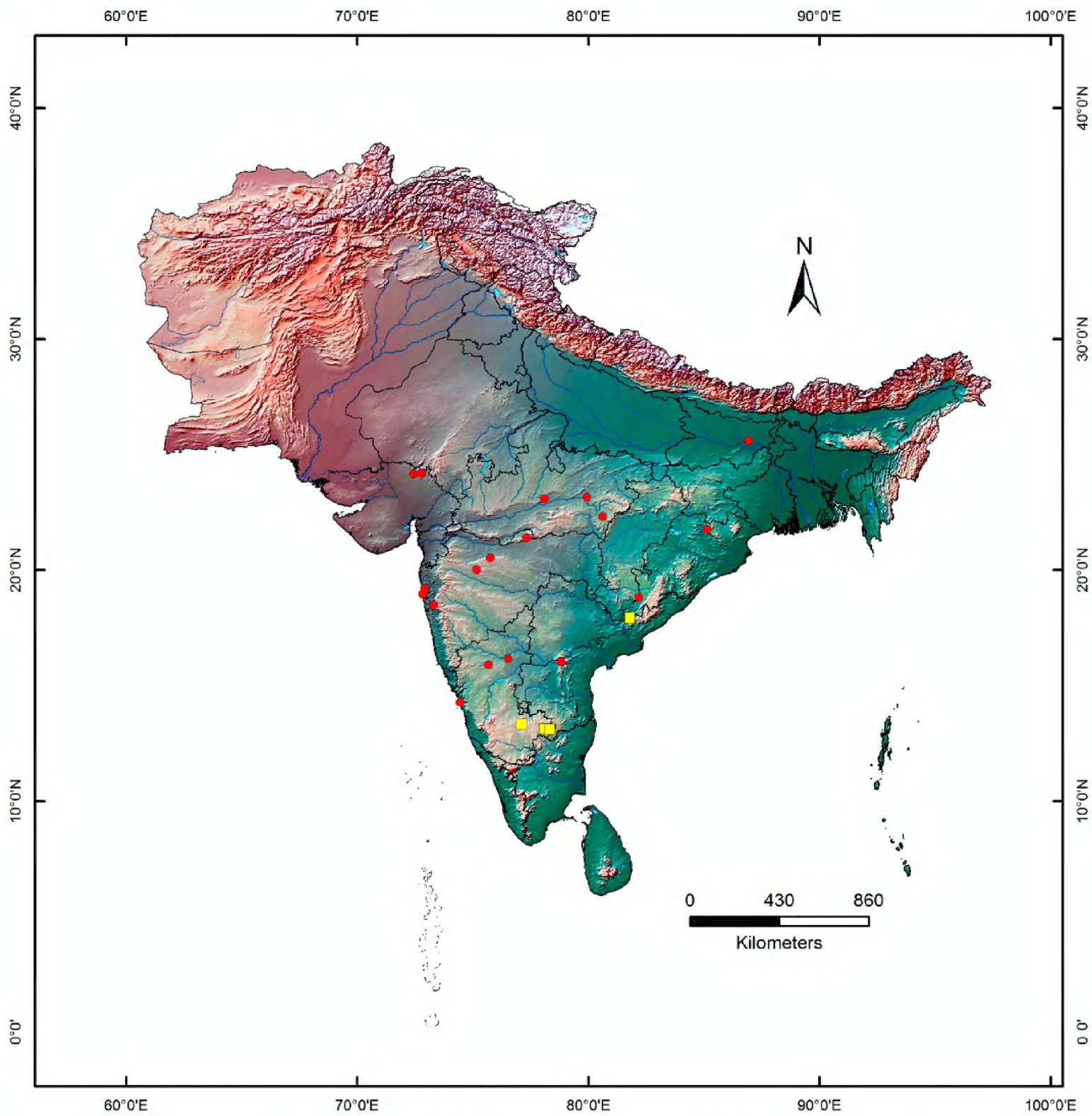

Figure 2. Distribution of Cantor's Leaf-nosed Bat, *Hipposideros galeritus*, in India. Red dots: existing locality records; Yellow squares: new locality records.

Results

New records. India, Avani, Kolar district (13.60° N, 078.19° E), Dr Bhargavi Srinivasulu, 9 November 2013, Photographed only, 1 male. India, Shivagange, Tumkur district (13.10° N, 077.13° E), Harpreet Kaur, 13 November 2013, Voucher No. (CHI.35.2014), 1 male.

India, Ukkarahalli, Kolar district (12.55° N, 078.14° E), Tariq Ahmed Shah, 14 May 2014, Voucher No. (CHI.31.2014), 1 female. India, Donkarai, East Godavari district (17.57° N, 081.44° E), G. Devender, 18 January 2014, Voucher No. (CHI.7.2014), 1 female.

Identification. Based on external measurements, craniodental measurements, and the characteristic presence of 2 pairs of supplementary leaflets, the individuals were identified as Cantor's Leaf-nosed Bat, *Hipposideros galeritus* Cantor, 1846 (Fig. 1), following Bates and Harrison (1997) and Srinivasulu et al. (2010). Baculum of the male specimen from Tumkur District, Karnataka was extracted (Fig. 2). This is a small to medium-sized species with forearm length (FA) averaging 47.2 mm. The noseleaf is simple and possesses 2 pairs of well-developed supplementary lateral leaflets (Fig. 1). The anterior leaf lacks the median emargination. Narial lappets are small and are present on the outer border of the nostrils.

Discussion

Hipposideros galeritus is known from many countries in south and southeast Asia. In south Asia, it is restricted to India and Sri Lanka. In India, the species has been reported from Andhra Pradesh, Bihar, Gujarat, Karnataka, Madhya Pradesh, and Maharashtra (Bates and Harrison 1997, Molur et al. 2002, Srinivasulu 2004). In Karnataka, *Hipposideros galeritus* was hitherto reported from Badami (Brosset 1962b), Honawar (Wroughton 1913), and Lingsugur (Ghosh 2008). In Telangana State (erstwhile Andhra Pradesh) it was reported from Akkamahadevibilam cave (Srinivasulu 2004) and in Odisha from Khandadhar Waterfall and Gupteshwar (Debata et al 2015). Through this note, we report the southernmost specimen based on records of this species from Ukkarahalli, Kolar district, Karnataka, which extends the range of this species by about 430 km in peninsular India

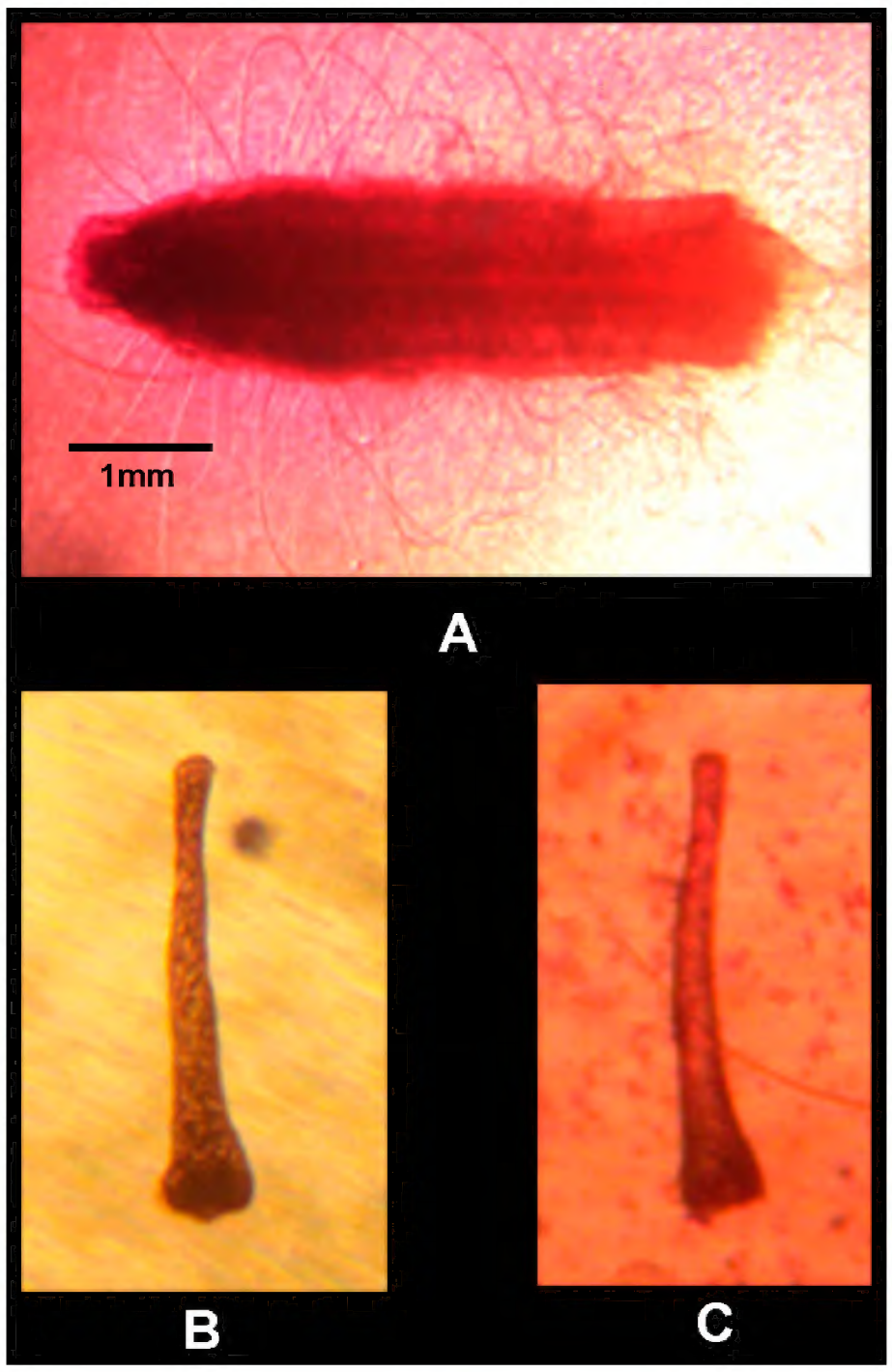

Figure 3. Baculum of *H. galeritus* from Tumkur District, Karnataka. **A.** Shape of the penis. **B.** Dorsal view of the baculum. **C.** Lateral view of the baculum.

from the nearest known locality, Honnavar, Karnataka. We also add additional site records of this species from Kolar and Tumkur districts in Karnataka, and report the presence of this species from Andhra Pradesh for the first time (Fig. 2). The bacular characteristics of the species were observed to be disparate from that of the specimens from Sri Lanka (Topál 1975, Bates and Harrison 1997).

Authors' Contributions

TAS and GD collected the specimens, CS made the analysis, and HK and BS wrote the text.

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